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# Critical Competencies for the Innovativeness of Value Creation Champions: Identifying Challenges and Work-integrated Solutions

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## Abstract

Medium-sized manufacturers of technical products with a high degree of in-house value adding activities – so-called *value creation champions* – are very important to the success of German industry and to safeguarding attractive jobs in Germany. Key to their success is their distinct innovativeness. The innovative capacities of these companies are increasingly under threat, especially as they are often based on the competencies of only few individual employees. Therefore, solutions are needed to first identify such critical competencies and then to develop new ways of work-integrated learning and knowledge exchange to develop respective capabilities. Based on current literature this paper first identifies the importance of four clusters of competencies, namely network competence, creative problem-solving competence, overview competence and integration competence, and explains under which conditions they should be rated as critical. This paper then proposes a five-step-process that enables companies to identify possible critical competencies and take suitable measures to avoid putting their innovativeness at risk.

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*Keywords:* innovativeness; critical competencies; networked competence development; implicit knowledge; knowledge transfer; industry 4.0

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## 1. Introduction

Important for economic performance and for attractive and secure employment in Germany are companies that are rather cautious with outsourcing decisions and operate with a high level of internal value added. Such a strategy usually pays off in terms of productivity as well as profits [1]. Important features of these companies that we will refer to as

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*value creation champions* are a high domestic ratio of value-added and local sourcing as well as a high export ratio. Often these medium-sized manufacturers of technical products belong to the approximately 1,300 "hidden champions" in Germany [2].

These companies also heavily rely on their innovativeness [3]. In order to be able to compete internationally, *value creation champions* must be able to cover a broader set of competencies than less integrated companies. Current innovation challenges are, above all, the digitization of work and production processes, the development of digital business models and the development of specialized products for a clearly defined market.

Innovation success is often based on the knowledge and the competencies of experienced employees, who possess an extensive network within the company and beyond [4]. Despite this, not even every seventh company has appropriate structures (such as suitable "back-ups" for the competencies of these employees) and processes in place to ensure its innovativeness independently of the competencies of these individual employees [5]. The project *ChampNet*<sup>1</sup> [6] is devoted to finding answers to the resulting challenges and questions. Therefore, this paper addresses the following questions: Under which circumstances can a competence become critical? Are there certain competencies in the workforce that are likely to be particularly important for the innovativeness of *value creation champions*? How can such companies identify possible critical competencies and take suitable measures to avoid putting their innovativeness at risk?

## 2. How shortages of competencies can become critical

There are numerous definitions of competence. Especially the distinction between competence and knowledge or skills is often unclear. Based on various definitions [7] that were developed in recent years, we here use the term competence to define the individual dispositional ability and readiness to act successfully and self-organized when facing novel, unstructured or complex situations or tasks and the ability to develop solutions for future situations. Competence is hereby based on the activation, combination and use of personal resources that can be developed (such as knowledge, networks, cognitive and practical skills) as well as on social aspects or behaviour but not on a person's character. Knowledge as well as cognitive and practical capabilities are necessary for the development of competencies.

Shortages of critical competencies can occur for various reasons. To identify them, the company first needs to clarify which of the employees' competencies are essential to remain competitive. In the case of *value creation champions* these are competencies which are crucial for the ability to innovate. They can become critical competencies when

- a. they are very rare within the company, so that only very few or even only one employee possesses these competencies, and / or
- b. they are primarily present in employees who are leaving the company in the near or foreseeable future, and / or
- c. they are difficult to replace due to a current or expected shortage of skilled labour, and / or
- d. they are difficult to externalize, which means that the development of these competencies is hence a lengthy process.

As soon as one of the aforementioned problems (a to d) applies and the competence is at the same time essential for the company to remain competitive, it can be considered as being a critical competence. The number of problems that apply to a certain competence determine how critical the shortage is. Possible future shortages have to be identified regularly and individually by each company and respective competencies and capabilities have to be developed proactively. However, there are some innovation-related competencies that are likely to be critical for *value creation champions*. These will be described in some detail in section 3.

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<sup>1</sup> The research and development project *ChampNet* runs from May 2015 to April 2018 and is funded by the German Federal Ministry of Education and Research (BMBF). The project focuses on questions concerning social network-based competency integration and development for *value creation champions* and involves two research partners, namely the Institute for Learning and Innovation in Networks (Karlsruhe University of Applied Sciences) and the Software Technology Institute (Bundeswehr University Munich), as well three leading German manufacturing companies.

### 3. Clusters of innovation competencies

The success of *value creation champions* strongly depends on their ability to innovate and create new knowledge. This is largely based on the knowledge, experience and individual dispositional abilities (i.e. the competencies) of their employees [8]. Insights that can be useful to identify such competencies can be found in the literatures on organizational behaviour, e.g. individual champion behaviour [9], on innovative work behaviour [10] or on promoters in the innovation process [11]. These streams of literature show that there are certain employees who – compared to other employees – contribute more to the innovation of products or processes, due to the way they work as well as their experience or competencies. The ability to innovate is often based on the simultaneous activation of different competencies [12]. Based on current literature, scientific discourse and on the input of the companies involved in the *ChampNet* project, we describe in this section four clusters of competencies that we identified to be essential for the innovativeness of *value creation champions* and briefly discuss their importance within the context of digitalization.

#### 3.1. The importance of network competence

Implicit and as a result rarely transferable knowledge based on experience is crucial for (technical) innovation [13]. Networking and direct interaction with those people inside and outside the company who possess such knowledge and competencies is therefore important for the development of radical product innovations [14]. Networking with customers, suppliers or research institutes is beneficial for innovative work [10,15]. As a result, the network competencies of marketing or R&D employees, who directly interact with (potential) customers, have been found to be essential for the cooperation of customers and companies and in turn for developing radical innovations [15].

Promotor research also emphasizes network capability to be a necessary competence for so-called process promoters and relationship promoters [16]. This is based on the insight that the implementation of innovation always requires to effectively inform and convince a variety of different stakeholders inside and outside the company. Moreover, innovation processes often require the cooperation and work of people with different competencies. To facilitate this, a company needs employees who are able to build and use appropriate networks [16].

We therefore define network competence to be a cluster of competencies that refers to the ability to effectively think, learn and act by using personal, social and organizational internal as well as external networks in order to achieve innovation-related advantages or targets.

#### 3.2. The importance of creative problem-solving competence

Important for innovative work behaviour is the ability to search for new opportunities and the generation of new ideas and solutions as well as their development, implementation and commercialization [17]. New and alternative ways of thinking, the constant search for improvements or the use of new methods are typical examples of what has been defined as innovative work behaviour [17]. Innovations – especially radical ones – often require solving complex and mostly ill-structured problems that cannot be addressed appropriately by using previous solutions. Consequently, creativity and creative problem-solving competencies are required [18]. These are based on the ability to use divergent thinking when solving problems, thus linking formerly separate ideas, explanatory patterns or processes to develop truly novel solutions [18].

Creativity is the ability to produce new and useful ideas. According to Amabile [19], creativity is based on (a) expertise, which can be used to solve problems or to perform tasks, (b) the ability to think creatively, for example by looking at things from a new perspective or by using creativity techniques and (c) the intrinsic motivation to solve the problem. Employees who prefer divergent thinking are intrinsically motivated to solve problems in a new way by using stimuli and knowledge from different areas [20].

We therefore define creative problem-solving competence to be a cluster of competencies that refers to the ability to recognize and define problems and to develop novel solutions with the help of (technical) knowledge, motivation, systemic problem recognition and creativity.

### 3.3. The importance of overview competence

As already mentioned above, (radical) innovations require combining different areas of knowledge or different patterns of thought. Innovative work behaviour for that reason takes into account how often employees deal with topics that are not part of their daily work or occupy themselves with other or new working methods or techniques [10]. Above all, this shows the ability to recognize and assess the value of new information or new knowledge. The individual ability to actually absorb and utilize this new information or knowledge is largely determined by the existing experience and the existing knowledge of the respective employee [21].

Over the years of a professional career, employees often develop a stock of knowledge that is mainly based on experience. This “subjective memory” [12] is never complete and is continually enriched and modified by new knowledge, events and experiences. At the same time, it is crucial to be able to gain an overview over new or different knowledge or ideas and to be able to evaluate these with regard to the intended use.

We therefore define overview competence to be a cluster of competencies that refers to the ability to recognize and understand different ideas, knowledge, experiences and processes as well as the ability to be aware of the key people who possess relevant knowledge or experience in order to assess these insights regarding their innovation potential.

### 3.4. The emphasized importance of integration competence

Knowledge transfer across internal and external boundaries contributes fundamentally to the innovativeness of a company [22]. New combinations of existing knowledge are just as vital for innovation [23] as knowledge that crosses internal boundaries or enters the company from the outside [24,25]. This suggests that employees who contribute to the combination and integration of knowledge play a central role in the company’s innovativeness. These innovators are technology- and market-oriented, possess a good overview over different (technical) areas and are able to recognize new market trends [26]. This combination enables them to develop ideas for new successful products. Moreover, these employees are also able to cooperate with others in the subsequent development and implementation process in order to integrate technical possibilities and customer needs in the best possible solution. Innovative work behaviour [10] as well as champion behaviour [9] consequently define the ability to involve and convince a range of people within the company as important. Promotor research also emphasizes the necessity of integration and relationship work as it helps to reduce the barriers that innovations often face and to bring together people who possess the knowledge that is required [16,27].

These activities also require different competencies of the clusters already explained before. For that reason, this cluster of competencies can be seen as a kind of a “master class” among the innovation competencies described in this paper. We therefore define integration competence to be a cluster of competencies that refers to the ability to combine constructively different ideas, (professional) knowledge and experiences of different people to achieve an (innovation-related) objective and to create something novel. This includes the ability to integrate both internal and external ideas and knowledge along the entire innovation process.

### 3.5. Innovation competencies in the context of digitalization

In recent years *value creation champions* increasingly face the challenges that are related to concepts such as the Internet of Things, Industrial Internet or Smart Manufacturing. These concepts have been found to be drivers of what is even described as the “fourth industrial revolution” [28] and are often referred to as Industry 4.0. A number of different papers have already stressed the importance of competence development in times of increasing digitalization of manufacturing processes, products and business models and explain why the clusters of competencies elaborated in this paper are especially vital within this context.

Ludwig et al. [29] point out that the increasing use of digital tools and virtual cooperation and information systems in the production process will require a better and broader understanding of the entire working context, process logic and the roles and requirements of different actors along the value chain (such as suppliers, plant manufacturers and customers). Moreover, the increasing interlinking of companies and customers will blur former distinctions between production, (customer-)service and administrative work and will require more overarching and integrative knowledge [29]. They also argue that the development of new “hybrid” products – made of tangible goods, complementary

services and interlinked expertise – will lead to a growing demand of “hybrid” and interdisciplinary work and the competencies that enable this. The increasing need for especially overview and integration competencies is also stressed by Erol et al. who point out that in complex Industry 4.0 environments a strong interdisciplinary “out-of-the-box” orientation is important [30]. This includes the ability to understand both the traditional production system, which is still vital for continuing operations, as well as the new, digital ways of production. To develop innovative products or processes, engineers need to grasp the interrelations between the electrical, mechanical as well as the digital components involved.

In addition, Erol et al. also highlight the importance of network and problem-solving competencies as the increasing complexity and scope of production processes “(...) require a mindset that is oriented towards building and maintaining networks of experts to be able to cooperate ad-hoc in finding appropriate solutions for particular problems” [30, p.14]. Also drawing attention to the increasing importance of creative problem-solving competencies, Letmathe and Schinner emphasize that in the digital industrial age employees will be less responsible for carrying out routine tasks and will be more involved with ad-hoc problem solving instead [31]. As many of the problems are unstructured, complex and employees will not be able to solve all problems individually, network competence is needed to solve them collaboratively [31].

Based on a survey involving 335 German mechanical and plant engineering companies (which can mostly be considered to be *value creation champions*) a recent study showed that digital innovations are likely to take place at the boundaries of different disciplines and therefore require competencies that allow interdisciplinary and collaborative work [32]. The study found that – besides specific IT-related competencies – the following three non-technical competencies were rated most valuable by the companies: (1) the ability to quickly grasp the business models and potential problems of customers, (2) to solve those problems creatively and (3) the ability to think and work using systematic and holistic ways of thinking [32].

#### 4. Identifying and preventing critical competencies

##### 4.1. Towards a structured process to identify and prevent critical competencies

For German *value creation champions* two challenges arise from the findings presented above: they need to (1) identify competencies that can potentially become critical and they need to (2) develop suitable methods and measures to prevent this. Within the project *ChampNet*, a process based on five successive steps to address these challenges was developed together with one of the companies involved. Figure 1 shows the five periodic steps that help to prevent competencies from becoming critical and eventually putting the company’s innovativeness at risk.

The first phase detects innovation-related competencies that are perceived as a shortage and consequently bear the potential of being critical. As part of the project *ChampNet*, twenty interviews with managers from the innovation, strategy, R&D, production and personnel departments were carried out. The key questions asked were “Which of your team members’ competencies do you consider to be especially important for the future of the company?” and “Which members in your team would cause serious problems if they left the company?”.

The second phase clusters the insights generated in these interviews into different bundles of competencies which are perceived as critical. In the *ChampNet*-related case described above, nine essential company-specific bundles, that relate to the four clusters of competencies described in section 3, were identified and outlined. Interviews with some of the employees who were mentioned to possess some of the competencies in question led to additional insights concerning their abilities, background and motivation.

The third phase assesses whether the bundles identified and described in phase two do actually need to be rated as critical. As part of their activities related to *ChampNet*, the company therefore first examined whether a bundle is of strategic importance for the company’s ability to innovate. Then, each of the criteria described in section 2 was used to determine whether and to what extent (on a scale from 1 to 5) the respective bundle must already be rated as critical or has a high risk of becoming critical. The company also assessed whether measures are already in place to develop the respective competencies and prevent them from becoming critical. Based on this assessment, the nine company-specific bundles were then weighted in three categories (low, medium or high) with regard to their potential of already being or becoming critical.

The fourth phase creates and conducts measures that ensure that more employees develop those competencies with a high potential of becoming critical. As shown in section 3, competencies that bear this risk are often based on individual experience and are mostly based on implicit knowledge. Hence, formal measures to transfer knowledge or develop competencies, such as workshops or standardized trainings, will not be sufficient. Instead new forms of work-integrated learning and informal knowledge-transfer are needed to facilitate a networked development of competencies. Different approaches to this are developed and tested within the *ChampNet* project. These are described in section 5.

The fifth phase evaluates whether the measures described in phase four were successful. This way they can be adapted and further developed if necessary. Within *ChampNet*, different options of evaluation are being explored. These include the design and test of a 4-stage-model based on the work of Dreyfus [33] and Krathwohl [34] to assess the development of the four clusters of competencies and the discussion and description of potentially useful digital traces that provide new insights into networked competence development and knowledge transfer [35].

After the evaluation phase, the process described above starts again with a new cycle.

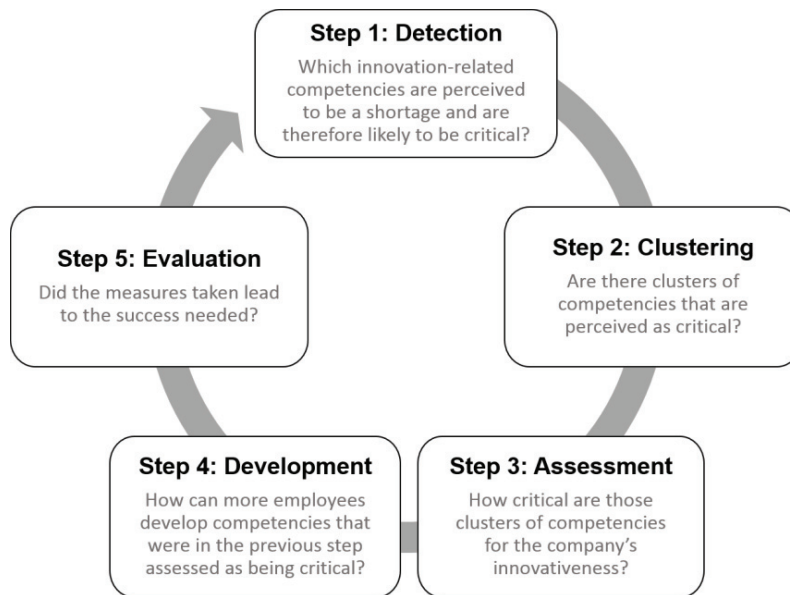


Figure 1. Five-step process to identify and prevent critical competencies

#### 4.2. Towards work-integrated solutions that facilitate the development of innovation competencies

Due to the complexity of the competencies outlined in section 3 and the mostly implicit nature of the knowledge involved, different measures are needed to facilitate the development of such competencies. Interestingly, these measures will revive an old concept of learning and development, with informal learning and work-integrated solutions being at the core of those measures [36]. Especially the establishment of communities of practice or internal learning communities and the use of networking technologies will enable the integration of knowledge transfer, learning and competence development within the processes of daily work [29].

Within *ChampNet*, different measures to facilitate work-integrated learning and knowledge exchange are developed and tested regarding their potential to facilitate the development of innovation competencies. Apart from mainly face-to-face-based measures, such as learning partnerships, that link an experienced employee who possess competencies that were rated as critical with a usually younger employee who needs to develop these competencies, new ways to develop competencies by using digital, social media environments, especially Enterprise Social Networks (ESN), are being explored. ESN can form the basis for various ways of work-integrated learning, such as the



establishment of online communities of practice, "Q&A forums" or tools that assist with finding certain expertise or experts within the company. This way, important knowledge can be distributed among many employees across different departments and the development of competencies can be supported. To explore how different ways of networking can facilitate work-integrated learning and competence development, one of the companies involved in *ChampNet* set up an online community of practice. Also, another company focussed on the development of an interdisciplinary community, involving both face-to-face interaction and networking in workshops as well as online knowledge exchange and interaction in an accompanying platform.

A better understanding how such work-integrated measures can be beneficial for the companies using them is desperately needed, as many *value creation champions* are still reluctant to use them. Kinkel et al. showed that companies still mainly count on traditional, non-work-integrated ways of competence development, such as trainings [32]. Learning partnerships or mentoring are less popular, and digital networking technologies, such as ESN, are only used intensively by few companies to facilitate networked competence development [32].

## 5. Conclusion and future research

The success of *value creation champions* strongly depends on their employees' competencies to innovate and create new knowledge. Based on current literature, we describe four clusters of competencies, namely network competence, creative problem-solving competence, overview competence and integration competence that are crucial for the innovativeness of the *value creation champions* involved in the *ChampNet* project. Moreover, we discuss the importance of these competencies with the context of increasing digitalization of products and processes – a challenge that many *value creation champions* currently face. An ongoing empirical study based on a survey of almost 200 of such companies in Germany will soon provide further insights and show to which extent our statements are generalizable.

We explain under which conditions such innovation-related competencies can become critical competencies. To avoid a critical shortage, companies need to regularly identify competencies at risk. They then need to develop suitable methods and measures to facilitate that more employees develop respective competencies. As a result, we propose and describe a five-step process that was developed and put into practice with one of the companies involved in the project. Finally, we draw attention to different work-integrated solutions that facilitate the development of innovation competencies.

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